TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION
U.S. DEPARTMENT OF AGRICULTURE · · FOREST SERVICE

No. 621

Spruce Budworm Defoliation Causes Continued Top Killing and Tree Mortality in Northeastern Minnesota

The area of spruce-fir type severely defoliated by the spruce budworm continues to increase in northeastern Minnesota (fig. 1). The 1961 aerial defoliation survey showed 240,000 acres of spruce-fir type in this condition, as compared with 96,000 acres observed in 1960. Severe defoliation is evidenced by a grayish appearance over the entire tree and is the result of 3 or more years of heavy defoliation of the new growth. These stands are characterized by extensive top killing and tree mortality.

During September 1960, 16 permanent sample plots were installed in the severely defoliated area to determine the amount of top killing and tree mortality actually occurring.[1] Fourteen of these plots were remeasured during September 1961, and one additional plot was also installed.

In the area classified as severe it was found that:

1. Balsam fir mortality during 1961 in trees 4 inches d.b.h. and larger averaged 1.4 cords per acre.[2] Some plots lost as much as 4.8 cords per acre.

2. Balsam fir mortality thus far during the budworm epidemic averages 2.3 cords per acre. This constitutes 16 percent of the original plot volumes.[3] Most of the mortality occurred in small patches.

3. Top killing of 2 or more feet now occurs in 34 percent of the merchantable-sized balsam still living.

4. Balsam trees less than 4 inches d.b.h. averaged 18 percent mortality during 1961. Cumulative mortality now averages 29 percent.

5. Very little top killing or tree mortality occurs in white spruce.

Except for obvious mechanical damage, it was not possible in this survey to separate natural mortality from that directly caused by the budworm. This will be reported upon in a later paper. Natural mortality, however, during only 1 year would generally be low.

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April 1962
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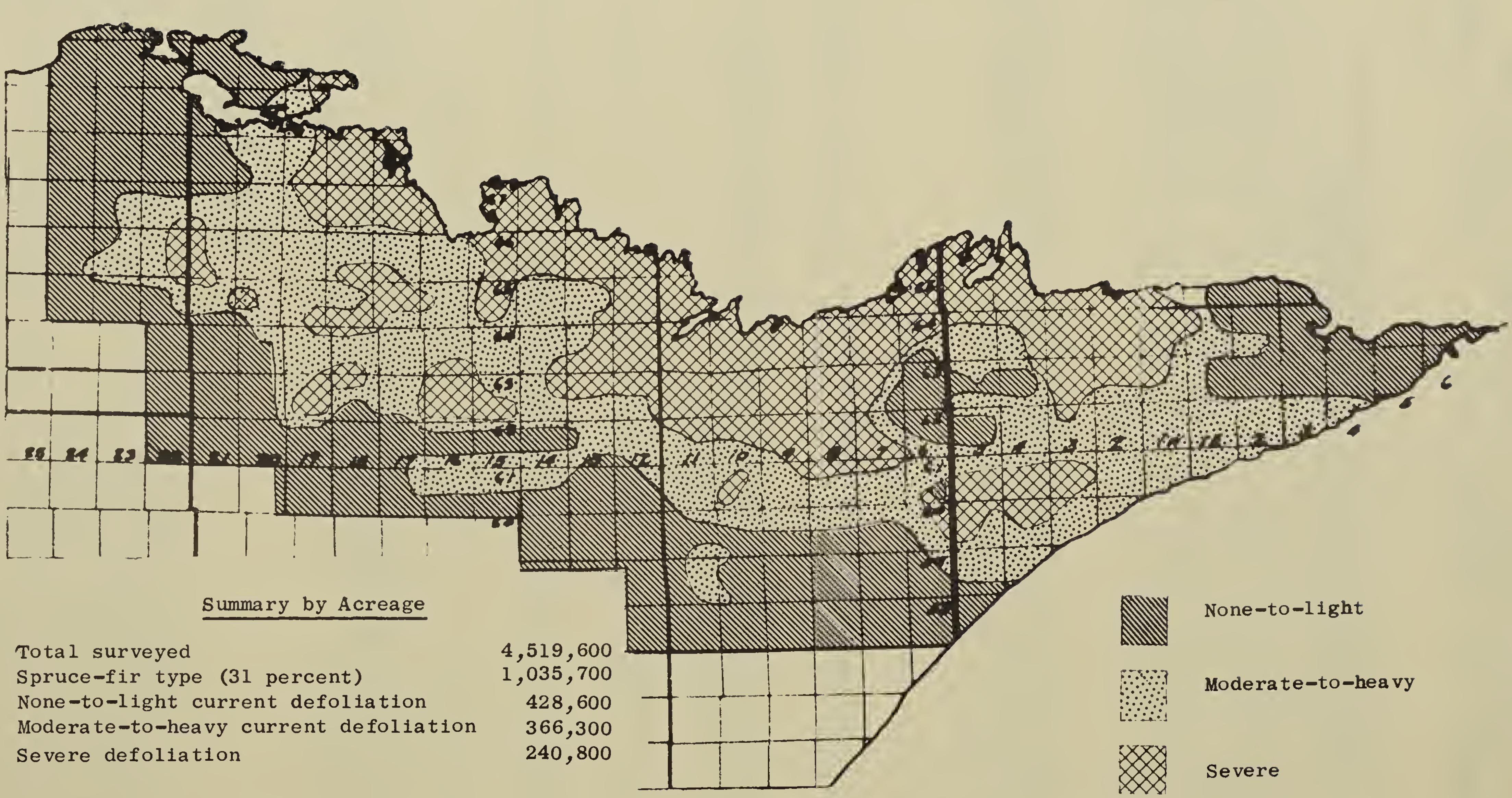
[1] Schmiege, D. C. Mortality and top killing of spruce-fir caused by repeated spruce budworm defoliation. U.S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 597, 2 pp. 1961. (Processed.)

[2] Volumes of mortality based upon Table 6 of Gevorkiantz, S. R., and L. P. Olsen. Composite volume tables for timber and their application in the Lake States. U.S. Dept. Agr. Tech. Bul. 1104, 51 pp., illus. 1955.

[3] Original volume based upon the stand volume equation: Cords = .003958 B·H as reported by R. E. Buckman. Development and use of three stand volume equations for Minnesota. Jour. Forestry 59: 573-575, illus. 1961.



Summary by Acreage

Total surveyed	4,519,600
Spruce-fir type (31 percent)	1,035,700
None-to-light current defoliation	428,600
Moderate-to-heavy current defoliation	366,300
Severe defoliation	240,800

Figure 1.--Spruce budworm defoliation in northeastern Minnesota, based on the 1961 aerial survey.